NICE³
Success Story

Ink Jet Printer Solvent Recovery

Ink Jet Printer Solvent Recovery System for Commercial Printing Applications Reduces Emissions

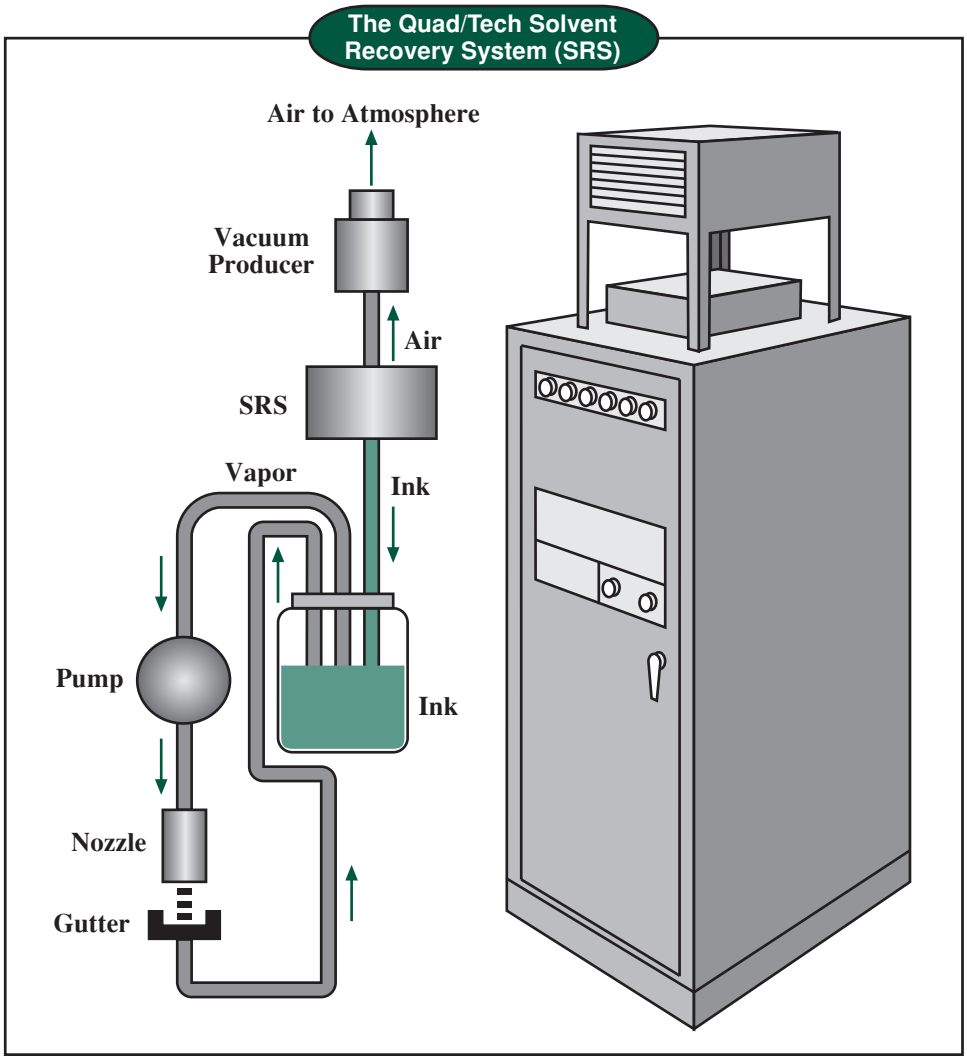
U.S. printers face an important challenge–how to be "green" and profitable. Environmental regulations require that printers report all sources of volatile organic compound (VOC) emissions. While the focus in the past has been solely on pressroom chemistry, regulators have broadened that focus to include all processes that use VOCs.

Benefits

- Through 2000, the cumulative energy savings have been over 150 billion Btu
- Through 2000, the cumulative reduction in NO_x emissions have been over 3800 tons and the cumulative CO_2 reduction has been 939,000 tons
- Reduced use of ink and solvent feedstocks due to recovery and recycle system
- Less downtime to replace depleted fluid reservoirs as less ink and solvent are needed
- Energy savings of 80 million Btu/year for a SRS with a Domino Jet Array printer
- Recovery of 60% to 70% of the VOC emissions from printer operation

Applications

The solvent recovery system can be used to capture and reuse VOCs in commercial printing processes.



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Ink-jet printing produces one of the largest waste streams in the printing industry because of the highly volatile solvents used in the process: methyl ethyl ketone (MEK), methanol, and isopropyl alcohol. All three elements are monitored under state and federal regulations, and two of the elements–MEK and methanol–are considered hazardous air pollutants. Acetone, a volatile fluid used in ink-jet printing, is another element of concern.

To reduce VOC emissions, Quad/Graphics, operators of several printing plants, and QTI, Quad/Graphics' printing equipment manufacturing subsidiary, worked together to develop a Solvent Recovery System (SRS). This closed-loop recycling system reduces the amount of fluid required by ink-jet printing, thereby reducing ink-jet printing costs, recovering harmful vapors, and improving printing productivity.

Quad/Graphics codeveloped and is using the SRS in several of its print facilities through a cost-share arrangement with the U.S. Department of Energy's (DOE's) NICE^3 (National Industrial Competitiveness through Energy, Environment, and Economics) Program. (Quad/Graphics contributed $3 million and DOE contributed $425,000). The grant program was a collaborative agreement among the DOE, the Energy Center of Wisconsin, the U.S. Environmental Protection Agency, Quad/Graphics, and QTI.

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Project Partners

- Quad/Graphics, Inc.
  Sussex, WI
- Wisconsin Energy Bureau
  Madison, WI

Technology Description

The SRS consists of a closed-loop ink supply tank that directs solvent vapors discharged from the tank through a vent tube. The vent tube is connected to a condenser that cools the vapors so nearly all the solvent is condensed. The condensed solvent is then returned to the ink supply tank via the vent.

The SRS is designed for use with continuous ink-jet printers. These printers are high-speed, lower resolution printers primarily used to label products, address magazines and catalogs, and personalize direct-mail or other documents.

The SRS offers several benefits in the printing process. It captures and reuses 60% to 70% of the volatile compounds associated with the process. The SRS also cuts the amount of ink and solvent usually lost as vapor by about half, resulting in a significant reduction in emissions. Because less fluid is used, the fluid containers do not have to be changed as often, resulting in labor savings and less downtime on the production line. Additionally, reduced VOC and acetone emissions create a healthier work environment for employees.

"QTI distinguishes itself from other research and development efforts in the industry because we share our creative solutions with printers worldwide," a company spokesperson said. The technology is perfected and demonstrated at one plant and replicated industry-wide so it can enhance the entire industry's performance.

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Marketing Success

At the end of 2000, more than 560 SRS units were in use. Quad/Graphics' plants are home to 425 of these units. Three of the currently available SRS models are designed for the Domino Jet Array, Videojet PrintPro, and Videojet 9416 printers. Because Domino Jet Array printers are prominent at the Quad/Graphics' plants, the model for this type of printer has been the most popular. The chart illustrates the type of annual savings from using SRS with a Domino Jet Array print engine. A simple payback of one to two years has been common for SRS users.

Annual Savings from Using the Solvent Recovery System with a Domino Jet Array Printer

Type of Savings	Operations		
	8 hours/day	12 hours/day	24 hours/day
Fluid recovered	180 quarts	260 quarts	540 quarts
VOCs saved	300 lb	430 lb	900 lb
Dollars saved*	$1,800	$2,600	$5,400
Btu saved ‡	8.0×10^7	12.1×10^7	25.1×10^7
Plastic packaging saved	33.8 lb	48.8 lb	101.25 lb
Corrugated packaging saved	37.0 lb	53.6 lb	111.2 lb

**Based on a fluid cost of $10.00 per quart.*

‡Btu saved from the reduced need to transport fluid, manufacture fluid, and manufacture the plastic containers the fluid is shipped in. This savings does not include savings from the reduced need for in-house manufacturing equipment as a result of productivity and efficiency gains.

NICE³ Program

NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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